

EFFECT OF CRYOGENIC FREEZING AND ADDITION OF LIQUID EGG PRODUCTS ON MILK AND WATER-BASED ICE CREAM

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Abstract

Ice creams are solid or cream-like products made from a pasteurized mixture of ingredients by freezing. Their texture can be improved by adding egg products because of the emulsifying properties of lecithin and the stabilizing molecules of egg white. Cryogenic freezing is a direct freezing technique, which results in small microcrystals in the product due to rapid heat extraction at the boiling temperature of -195.8 °C. Aim of the research was to determine if the positive effects of cryogenic freezing on the crystal structure can be combined with the good emulsifying and stabilizing qualities of eggs.

In our study, fruit-flavoured (water-based) and chocolate-flavoured (milk-based) ice cream bases containing no egg, 10% liquid whole egg, egg yolk and egg white were frozen with cryogenic and conventional (ice-cream machine) freezing with continuous foaming. The pH was measured by a pH meter, the objective colour by a chroma meter (CIELab) and dry matter content by drying at 105 °C to constant weight. Besides, the rheological properties of the bases were examined by a rotary rheometer and the hardness of frozen samples by a texture analyzer. The melting and freezing properties were monitored by melting experiment and differential scanning calorimeter. The evaluation was performed by ANOVA.

We found that freezing and the addition of liquid egg products is causing significant changes in the lightness and red-green colour attribute. The melting properties of milk-based ice cream changed significantly due to the addition of egg yolk and whole egg. Amount of non-freezing water didn't change, but the initial temperature of intense melting increased due to the addition of egg products. Texture of the water-based samples became softer due to the addition of whole egg and egg white.

In conclusion, the cryogenic freezing and the addition of egg products have a positive effect on the chocolate ice cream. In case of fruit ice cream samples, the addition of egg helped to improve the consistency, however, further experiments could be done, for example, by increasing the level of foaming, so the amount of bounded air could be increased due to the stabilizing ability of the egg white.

Key words: *Water-based ice cream, Milk-based ice cream, Liquid egg, Cryogenic freezing, Liquid nitrogen.*